WE CLAIM:

1. A prosthetic material comprising:
a scaffold having interconnecting, uniformly shaped pores; and
a multilayer ingrowth matrix within the pores.

2. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a synthetic material.

3. The prosthetic material of Claim 2 wherein the synthetic material comprises a hydrogel.

4. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a protein.

5. The prosthetic material of Claim 4 wherein the protein is selected from the group consisting of fibrin, collagen, glycosaminoglycan, and combinations thereof.

6. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a protein and a synthetic material.

7. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a growth factor.

8. The prosthetic material of Claim 7 wherein the growth factor is selected from the group consisting of VEGF, bFGF, PDGF, and combinations thereof.

9. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a peptide.

10. The prosthetic material of Claim 9 wherein the peptide is selected from the group consisting of RGD, DGEA, REDV, LDV, SIKVAV, YIGSR, and combinations thereof.

11. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a delivered gene.

12. The prosthetic material of Claim 11 wherein the delivered gene comprises antisense oligonucleotides towards angiogenic inhibitors.

13. The prosthetic material of Claim 11 wherein the delivered gene comprises antisense oligonucleotides towards pro-apoptotic factors.

14. The prosthetic material of Claim 11 wherein the delivered gene comprises a gene for increased expression of pro-angiogenic factors.

15. The prosthetic material of Claim 11 wherein the delivered gene comprises a gene for increased expression of anti-apoptotic factors.

16. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a synthetic material and at least a one layer of the ingrowth matrix comprises a protein.

17. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a surface modifying layer lining the pores.

18. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix that allows introduction of active peptides into a factor XIII crosslinker of fibrinogen during fibrin polymerization.

19. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix derivitized with collagen peptides.

20. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix derivitized with fibronectin peptides.

21. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix derivitized with laminin peptides.

22. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix that facilitates binding of heparin to heparin binding peptides.

23. The prosthetic material of Claim 22 wherein the heparin binding peptides include ATIII.

24. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a fibrin matrix that stores growth factor and gradually releases the growth factor as ingrowing cells degrade the fibrin.

25. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises a polyethylene glycol matrix.

26. The prosthetic material of Claim 25 wherein the polyethylene glycol matrix is modified to mediate adhesion of specific cells.

27. The prosthetic material of Claim 25 wherein the ingrowth matrix further comprises cell specific degradation sites combined with the polyethylene glycol matrix.

28. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises polyethylene glycol-containing adhesive and degradation sites.

29. The prosthetic material of Claim 1 further comprising interconnecting, helically oriented channels within the scaffold.

30. The prosthetic material of Claim 1 wherein substantially all of the pores have diameters within 300 μm of one another.

31. The prosthetic material of Claim 1 wherein the pores are spherically shaped.

32. The prosthetic material of Claim 1 wherein the ingrowth matrix comprises between 2 and 8 layers

33. The prosthetic material of Claim 1 wherein at least one layer of the ingrowth matrix comprises a concentration gradient of material.

34. The prosthetic material of Claim 1 comprising a vascular graft.

35. The prosthetic material of Claim 1 comprising a sewing ring.

36. The prosthetic material of Claim 1 comprising a synthetic heart valve.

37. A prosthetic material comprising:
a scaffold having interconnecting, helically oriented channels; and
a multilayer ingrowth matrix within the channels.

38. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a synthetic material.

39. The prosthetic material of Claim 38 wherein the synthetic material comprises a hydrogel.

40. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a protein.

41. The prosthetic material of Claim 40 wherein the protein is selected from the group consisting of fibrin, collagen, glycosaminoglycan, and combinations thereof.

42. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a protein and a synthetic material.

43. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a growth factor.

44. The prosthetic material of Claim 43 wherein the growth factor is selected from the group consisting of VEGF, bFGF, PDGF, and combinations thereof.

45. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a peptide.

46. The prosthetic material of Claim 45 wherein the peptide is selected from the group consisting of RGD, DGEA, REDV, LDV, SIKVAV, YIGSR, and combinations thereof.

47. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a delivered gene.

48. The prosthetic material of Claim 47 wherein the delivered gene comprises antisense oligonucleotides towards angiogenic inhibitors.

49. The prosthetic material of Claim 47 wherein the delivered gene comprises antisense oligonucleotides towards pro-apoptotic factors.

50. The prosthetic material of Claim 47 wherein the delivered gene comprises a gene for increased expression of pro-angiogenic factors.

51. The prosthetic material of Claim 47 wherein the delivered gene comprises a gene for increased expression of anti-apoptotic factors.

52. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a synthetic material and at least a one layer of the ingrowth matrix comprises a protein.

53. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a surface modifying layer lining the channels.

54. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix that allows introduction of active peptides into a factor XIII crosslinker of fibrinogen during fibrin polymerization.

55. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix derivitized with collagen peptides.

56. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix derivitized with fibronectin peptides.

57. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix derivitized with laminin peptides.

58. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix that facilitates binding of heparin to heparin binding peptides.

59. The prosthetic material of Claim 58 wherein the heparin binding peptides include ATIII.

60. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a fibrin matrix that stores growth factor and gradually releases the growth factor as ingrowing cells degrade the fibrin.

61. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises a polyethylene glycol matrix.

62. The prosthetic material of Claim 61 wherein the polyethylene glycol matrix is modified to mediate adhesion of specific cells.

63. The prosthetic material of Claim 61 wherein the ingrowth matrix further comprises cell specific degradation sites combined with the polyethylene glycol matrix.

64. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises polyethylene glycol-containing adhesive and degradation sites.

65. The prosthetic material of Claim 37 wherein substantially all of the channels have a diameter within a range of 300 μm of one another.

66. The prosthetic material of Claim 37 wherein the ingrowth matrix comprises between 2 and 8 layers

67. The prosthetic material of Claim 37 wherein at least one layer of the ingrowth matrix comprises a concentration gradient of material.

68. The prosthetic material of Claim 37 comprising a vascular graft.

69. The prosthetic material of Claim 37 comprising a sewing ring.

70. The prosthetic material of Claim 37 comprising a synthetic heart valve.

71. A prosthetic material comprising:

a scaffold having interconnecting, uniformly shaped pores; and

an ingrowth matrix within the pores, wherein the ingrowth matrix comprises a concentration gradient of material.

72. The prosthetic material of Claim 71 wherein the material in the concentration gradient comprises a synthetic material.

73. The prosthetic material of Claim 72 wherein the synthetic material comprises a hydrogel.

74. The prosthetic material of Claim 71 wherein the material in the concentration gradient comprises a protein.

75. The prosthetic material of Claim 74 wherein the protein is selected from the group consisting of fibrin, collagen, glycosaminoglycan, and combinations thereof.

76. The prosthetic material of Claim 71 wherein the material in the concentration gradient comprises a protein and a synthetic material.

77. The prosthetic material of Claim 71 wherein the material in the concentration gradient comprises a growth factor.

78. The prosthetic material of Claim 71 wherein the material in the concentration gradient comprises a peptide.

79. The prosthetic material of Claim 71 wherein the concentration gradient comprises a delivered gene.

80. The prosthetic material of Claim 71 wherein the concentration gradient comprises a fibrin matrix.

81. The prosthetic material of Claim 71 wherein the concentration gradient comprises a polyethylene glycol matrix.

82. The prosthetic material of Claim 71 further comprising interconnecting, helically oriented channels within the scaffold.

83. The prosthetic material of Claim 71 wherein substantially all of the pores have diameters within 300 μm of one another.

84. The prosthetic material of Claim 71 wherein the pores are spherically shaped.

85. The prosthetic material of Claim 71 comprising a vascular graft.

86. The prosthetic material of Claim 71 comprising a sewing ring.

87. The prosthetic material of Claim 71 comprising a synthetic heart valve.

88. A prosthetic material comprising:

a scaffold having interconnecting, helically oriented channels; and

an ingrowth matrix within the pores, wherein the ingrowth matrix comprises a concentration gradient of material.

89. The prosthetic material of Claim 88 wherein the material in the concentration gradient comprises a synthetic material.

90. The prosthetic material of Claim 89 wherein the synthetic material comprises a hydrogel.

91. The prosthetic material of Claim 88 wherein the material in the concentration gradient comprises a protein.

92. The prosthetic material of Claim 91 wherein the protein is selected from the group consisting of fibrin, collagen, glycosaminoglycan, and combinations thereof.

93. The prosthetic material of Claim 88 wherein the material in the concentration gradient comprises a protein and a synthetic material.

94. The prosthetic material of Claim 88 wherein the material in the concentration gradient comprises a growth factor.

95. The prosthetic material of Claim 88 wherein the material in the concentration gradient comprises a peptide.

96. The prosthetic material of Claim 88 wherein the concentration gradient comprises a delivered gene.

97. The prosthetic material of Claim 88 wherein the concentration gradient comprises a fibrin matrix.

98. The prosthetic material of Claim 88 wherein the concentration gradient comprises a polyethylene glycol matrix.

99. The prosthetic material of Claim 88 wherein substantially all of the channels have diameters within 300 μm of one another.

100. The prosthetic material of Claim 88 comprising a vascular graft.

101. The prosthetic material of Claim 88 comprising a sewing ring.

102. The prosthetic material of Claim 88 comprising a synthetic heart valve.